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In the Matter of

Allocation of Spectrum in the  
5 GHz Band to Establish a Wireless  
Component of the National Information  
Infrastructure

RM No. 8653

In the Matter of

Petition for Rulemaking to Allocate the  
5.1 - 5.35 GHz Band and Adopt Service  
Rules for a Shared Unlicensed Personal  
Radio Network

ET Docket No. 96-102

RM No. 8648

REPLY COMMENTS OF THE NATIONAL SCIENCE FOUNDATION  
WIRELESS FIELD TEST FOR EDUCATION PROJECT

These comments are filed in Reply to, and after consideration of, the comments filed by various entities before July 15th, regarding the NPRM Docket No. 96-102. We also filed in response to the NPRM. This is in extension of those remarks.

As the Principal Investigator of a series of field tests of wireless data communications for education, I file these comments on behalf of the technical staff of this project, which represent no commercial manufacturer or service, nor government agency, (and not the NSF itself) but only the considered judgements of independent investigators evaluating the potential for US education of wireless data communications in the context of the broadest public policy interests. This project's status, progress, and findings can be accessed at <http://wireless.oldcolo.com>

REPLY TO APPLE NPRM COMMENTS

After carefully studying the comments by Apple Computer, Inc filed on July 15th, we continue to oppose their proposal (RM-8653) as originally submitted for a new, non-spread spectrum shared wireless service of 150Mhz between 5.725 and 5.875Ghz, at 1 watt of power, as originally submitted, and as explained and amplified in their remarks.

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We reiterate that we are strongly for the principle of longer range (15 km or greater) no-licence wireless service, and forecast a major need for such service, operating at least at 1 watt of output power, but we find, that unless the rules prescribe spread spectrum propagation, and even higher standards for frequency hopping than is currently required for Part 15 devices, we can find no effective solution to the problem of potential interference, including with already extant Part 15.247 devices, in the Apple proposal.

Apple does not propose technological means for reducing the possibility of interference by radios built to their rules, but a scheme of locally-administered, cooperative, non-binding procedures, including embedded transmitter IDs, informal coordination entities, and narrow-band channel allocations of the spectrum.

We think that this approach is essentially unworkable, for the following reasons:

a. It makes assumptions that local area radio operators will coordinate and cooperate consistently in a frequency allocation in the greater general interest, rather than their own self interest at important junctures. That is a laudable expression of faith in the local community cooperativeness but such a level of cooperation has not even been seen among licenced Amateur Radio operators, whose uses of radio are generally less mission-critical than organizations such as schools and colleges, or businesses, who hope to become dependent on their wireless communications.

b. The level of local radio engineering technical expertise required to do a thorough job in coordinating the uses of a substantial number of radios in a local area, and the effort to operate a consortium, across all 'communities' in the United States simply does not exist. Even the delegation of frequency clearing duties by the FCC to NABER, is predicated on the ultimate yes-no licencing power of the FCC, not cooperation.

c. The spectrum analyzer equipment necessary to both analyze the spectrum in a given local area, to arbitrate disputes, and technically 'manage' frequency coordination in a local area is both costly and highly technical. Who, locally, will buy it? And who will mount, and keep current, the proposed data base?

d. Without enforcement powers, such 'consortia' will be very weak, and totally dependent upon the consent, not only of the majority of radio operators, but virtually all of them. That is an unrealistic expectation.

The dividing up of the 150mhz for this wireless no-licence service, into smaller bands, locally coordinated, seems a step backward in the means to reduce interference, rather than a step forward into technical requirements that put a premium on radio technologies that inherently are less prone to interference or being interfered with.

The scheme also assumes that all radios using these bands would be capable of being switched to narrow-band uses. That would have to be forced by the FCC rules for type certification.

In short, the scheme proposed by Apple will not, in our judgement, make a workable spectrum-sharing service in the 5.725 to 5.875Ghz bands for propagation techniques that require frequency allocation of sub-bands within local areas. That is just no substitute for spectrum-sharing that is based on technological answers to potential interference - such as spread spectrum operations with newer rules (than those promulgated in 1985) that take into account the higher processing gain now possible with new radios and processors.

Additionally, we note that Apple has, in their NPRM filing, backed off of their request for 1 watt of output power, and indicated that they would not object if the power output were reduced to ".1 watt (+ 20 dBm) and .316 watts (+ 25 dBm) for personal/portable and fixed equipment."

We disagree. For Apple's view of 'community networking' does not correspond with our experience in the matter using Part 15 radios in both small towns and portions of larger cities. Apple continually assumes/recommends that the proposed service be for 'point to point' communications, involving highly directional antennas. True community networking by no-licence shared-spectrum wireless requires point to multi-point systems, with the capability particularly at the hub, or ISP location, of erecting an omni antenna that can serve multiple outlying radio sites, which may be anywhere in a 360 degree circle of the omni's radiation pattern. Outlying stations may use a directional antenna aimed at the hub's omni, but unless the base station has the power to reach all outlying stations at a range of at least 15km in any direction, the whole idea of the ability of a school, college, government, or commercial ISP site being able to serve a community of people inside a circular area of 15km radius, gets undercut. And the fact that the higher the frequency the less capability the transmissions have to penetrate walls or go through vegetation common to towns and cities - puts even more a premium on power.

As we have commented before, we are not even comfortable with the 1 watt limitation, especially for rural areas, where we think 3 watts is a minimum power level, and 5 would be better - provided the technology used, such as spread spectrum, inherently was less susceptible to generating interference.

But all of this comes back to the basic problem with the Apple proposal - it won't work properly for the 'community networking' purposes unless a technology is used that permits a high density of radios in an urban area, and permits reaching further in rural areas. Both of which are greatly needed for the purpose, but for which purpose the Apple proposal is flawed.

## WINForum Proposal

We support the WINForum (RM-8648) request for low power SUPERNET service of no more than -10 dBW power across 200Mhz in the 5.15 - 5.15Ghz bands only, as proposed by the FCC in the NPRM.

We oppose the FCC NPRM proposed extension of the WINForum request, for an additional 150Mhz of bandwidth into the 5.725 - 5.875GHz band range. It will interfere with existing Part 15.247 radios which can do the job of the Apple proposal.

## OTHER CONSIDERATIONS

As we filed in our comments for the NPRM, we believe that, while the Apple proposal for longer range 'community networking' is addressed to a major need - for which the US Government seems even ready to support with a Universal Service fund for subsidy of connection for those unable to afford unregulated commercial service costs - that the FCC needs to step back and take a wholly new look at what rules should be made for technological/economic wireless shared spectrum capabilities that did not exist 10 years ago when it made the initial Part 15 rules, and which are becoming ever more obsolete and inadequate.

We believe that the FCC should issue an NOI that starts a process that seriously considers the following:

1. The Rules for NII Bands should be market-centric. Not one size fits all. (Rural is not Urban)
2. The minimum technical rules for the performance of the radios - such as frequency hopping rules - should be raised to the point that local interference between like radios is minimized.
3. The rules should take into account 'product life' factors for radio design - which, because of rapid change in processing power has to build change into the system - not endless vested interests in obsolete technologies.
4. The rules should be oriented toward the characteristics of 'complete systems' and 'how they will be operated' and not just looking at discrete radio specifications and then separately at antenna design.
5. There should be encouragement in the rules for designers to build 'smart radios' which can search wide spectrum bands, sensing whether there is traffic at the instant, and only communicating on that frequency when there is none.
6. And the FCC rulemaking mechanism should treat future generations of advanced radios as more possessing the technological dynamism and

change more associated with computers, than older generations of radios.

Computer and radio technology are converging. The FCC needs to reflect that new reality. And deal with the historic problem of potential interference by radios increasingly by technological rules more than administrative radio management - as wrongly proposed by Apple in their NPRM filing.



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